

# TABLE OF CONTENTS

	Page
PQS USER'S GUIDE.....	iii
DEFINITIONS OF WORDS USED IN PQS .....	vii
CONTRIBUTING FLEET PERSONNEL.....	ix
FUNDAMENTALS AND SYSTEMS SUMMARY.....	xi
FUNDAMENTALS	
0101 Mechanical.....	1
0102 Boiler.....	4
0103 Electrical.....	6
0104 Engineering Administration.....	8
0105 Engineering Safety Precautions.....	9
SYSTEMS	
0201 Basic Steam Cycle.....	13
0202 600 PSI (V2 M8) Boiler.....	15
0203 Combustion Air.....	17
0204 600 PSI Main Steam.....	18
0205 600 PSI Desuperheated Steam.....	20
0206 150 PSI Auxiliary Steam.....	22
0207 Steam Atomizing.....	23
0208 Auxiliary Exhaust.....	25
0209 Propulsion Turbines and Reduction Gears.....	27
0210 Main Shafting, Bearings and Propeller.....	29
0211 Main Lube Oil Service and Purification.....	31
0212 Main Condenser Seawater-Circulating.....	33
0213 Gland Exhaust.....	35
0214 Ship's Service Turbogenerator (SSTG).....	36
0215 Auxiliary Condenser Seawater-Circulating.....	38
0216 High-Pressure (HP) and Low-Pressure (LP) Drain.....	40
0217 Main Feed.....	42
0218 Main and Auxiliary Condensate.....	44
0219 Fuel Oil Service.....	46
0220 Main and Secondary Drainage.....	48
0221 Firemain.....	50
0222 Auxiliary Machinery Cooling Water.....	52
0223 Flash-Type Distilling Plant.....	54
0224 Low-Pressure (LP) Air.....	56
0225 Main and Auxiliary Air Ejectors.....	58
0226 High-Pressure (HP) Air.....	60
0227 Throttle Control Console.....	62
0228 Oily Water Separator.....	63
0229 Boiler Console.....	64
0230 No-Break Power Supply.....	65

## SYSTEMS (CONT'D)

	Page
0231 Ship's Service Switchboard Control Unit.....	67
0232 Alternating-Current (AC) Ship's Service Distribution.....	69
0233 Impressed-Current Cathodic Protection.....	71
0234 Electrohydraulic Steering.....	73
0235 JP-5 Transfer and Service.....	75
0236 Ship's Service Diesel Generator (SSDG).....	77

QUALIFICATION SECTION.....	79
----------------------------	----

## WATCHSTATIONS

0301 LKA-113 Class Engineering Officer Of The Watch (EOW).....	81
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## ENGINEERING PQS USER'S GUIDE

This guide will explain the Personnel Qualification Standards (PQS) program, what it is, and how to use it.

### I. WHAT IS PQS?

The PQS Program is a qualification system for officer and enlisted personnel to perform certain duties. A PQS is a compilation of the minimum knowledge and skills required to qualify for a specific watchstation, maintain specific equipment or perform as a team member within a unit. The PQS Program is not designed as a training program, but provides many training objectives. This PQS will assist you in becoming a more productive member of the "combat-ready qualified Navy team."

### II. WHAT MAKES UP THE PQS PROGRAM?

The PQS program consists of the Standard booklet and the Progress Chart.

A. The Standard booklet contains questions you must be able to answer and performance items you must be able to do in order to qualify for a particular Watchstation/Workstation. Standards are written by naval personnel after asking themselves, "What do I need to know to do the job properly?"

The Standard booklet is made up of the following parts:

1. TABLE OF CONTENTS
2. USER'S GUIDE
3. DEFINITIONS OF WORDS USED IN PQS
4. CONTRIBUTING FLEET PERSONNEL
5. FUNDAMENTALS AND SYSTEMS SUMMARY
6. FUNDAMENTALS (100 SECTION)
7. SYSTEMS (200 SECTION)
8. QUALIFICATION SECTION
9. WATCHSTATIONS/WORKSTATIONS (300 SECTION)
10. FEEDBACK FORM

B. The Progress Chart is used to display all the Standards in progress or that have been completed by your division or work center. Your division officer uses the progress chart to determine who is qualified to stand the watches or perform the tasks required by your division. You should check the progress chart periodically to make sure all of the Standards you have completed have been recorded.

### III. PQS FORMAT

A. The numbers in PQS follow a definite pattern. The following breakdown of the numbering system is a handy key to PQS format:

<u>Subject</u>	<u>1st Digit</u>	<u>2nd thru 4th Digit</u>
Engineering	7 = Main Propulsion 8 = Electrical 9 = Auxiliary 0 = Engineering Officer of the Watch (EOOW)	100 section = Fundamentals 200 section = Systems 300 section = Watchstations

B. Each Fundamental, System and Watchstation/Workstation is assigned a four-digit number.

Example: 0203

- 0 - Indicates qualification area (0 = Engineering Officer of the Watch (E00W))
- 203 - Indicates section 2 (System section) and that it is the 3rd System

In the Systems section of your Standard booklet, you may find a format such as the following example. For item .21 you must answer questions A and B. For items .22 and .23 answers to questions A, B and C are required. If there is no grid with X's, all questions must be answered.

0203.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?

	A	B	C
.21 Automatic shutter	X	X	
.22 Electric motor	X	X	X
.23 Force-draft blower (FDB) inlet vane-operator	X	X	X

C. Qualification Group Numbering System

The Watchstation/Workstation section (300) is divided into qualification groups. Your book may be used for more than one final qualification such as LKA-113 Class Engineering Officer of the Watch (E00W). Each group is indicated on a Final Qualification Sign-Off Page as follows:

Example: NAVEDTRA 43140-OAQ1

- 43140 - Indicates NAVEDTRA number assigned to the PQS package
- 0 - Indicates Engineering Officer of the Watch (E00W)
- A - Indicates first revision
- Q1 - Indicates the first qualification group

1. FUNDAMENTALS (100 Section) This section identifies basic knowledge needed to do the job properly. Normally you would have acquired this knowledge during the school phase of your training. If you have not been to school, the requirements are outlined and the references listed will aid you in a self-study program.

2. SYSTEMS (200 Section) In systems, the subject under discussion is broken down into functional sections that may be compared to the electrical system in your car. The components of the electrical system are scattered throughout your car, but taken all together they form the "electrical system." The same is true of the equipment you are studying. The components may not all be located in one place, but they still form a system.

3. WATCHSTATIONS/WORKSTATIONS (300 Section) This section contains the procedures you need to know to properly perform your job. Watchstations/Workstations are divided into final qualification "groups" (Qual 1, Qual 2 etc.) with each group containing the following:

a. Final Qualification Sign-Off Page

Final record that is filed in your training jacket and recorded in your Service Record upon final qualification

b. Qualification Summary Page

Record of completion of other PQS qualifications, and Watchstations/Workstations within a qualification group

c. Watchstations/Workstations (Task Sign-Off Pages)

Record of completion of performed tasks for each Watchstation/Workstation and instruction watches required by each Watchstation in a qualification group

#### IV. HOW TO QUALIFY

A. Your division officer or work center supervisor will issue you a PQS booklet. Your supervisor will assign Watchstations/Workstations and set time limits (goals) for completing your qualification. Progress toward qualification will be monitored on the division/work center Progress Chart. The estimated completion time, shown at the beginning of each Watchstation/Workstation, is only a recommendation and may be modified by your command. It indicates how long it will take the average sailor under normal conditions to complete each Watchstation/Workstation.

B. Open your Standard booklet to your assigned Watchstation/Workstation. At the beginning of the Watchstation/Workstation you will find a list of items that must be completed before starting your tasks. Standards may include Watchstations/Workstations other than the one on which you are working. Concentrate on the prerequisites for the Watchstation/Workstation to which you have been assigned and do not delay your qualification by spending time on others.

C. Complete the Safety Precautions Fundamentals first, then the rest of the required Fundamentals and Systems. Your supervisor may require you to complete these in a certain order, if not, the choice is up to you. If you do not know the answer to a question in the Standard booklet, look up the answer in one of the reference books listed. If you cannot find the answer in the reference books, ask your supervisor for help.

D. As you complete a Fundamental or System section, have the Qualification Petty Officer sign your Fundamentals and Systems Summary page. When you have completed all prerequisites, you are ready to start the performance items listed for that Watchstation/Workstation. Report your completion of all requirements of that Watchstation/Workstation to your supervisor.

## V. THE SUPERVISOR

A. As a senior petty officer, you will be required to assign junior personnel to complete specific Watchstations/Workstations in PQS. When you do this, always look through the Standard booklet to determine other items that should be completed before work is started on the required Watchstations/Workstations or related Fundamentals and Systems. If you are assigning more than one Watchstation/Workstation or section to be completed, it is your decision to specify which one should be completed first. The supervisor is an extremely important part of the PQS program if it is to be successful. If you administer PQS with insight, you will find that PQS is a helpful tool that can fit into your overall training plan. You will be responsible for the accuracy, updating, and tailoring of PQS to fit your command's needs, as well as for the initiation of appropriate feedback to the PQS Development Group (feedback forms are located in the back of each Standard booklet). You should provide motivation to your personnel by assigning goals, showing interest, and following the trainees' progress. The supervisor is responsible for training and should be the one to update and maintain the progress chart. It is important that the supervisor be aware of who is and who is not progressing, as well as where counseling or individual instruction may be needed. A sample PQS progress chart can be found in the PQS Manager's Guide (NAVEDTRA 43100-1B). As a supervisor you must be totally familiar with the duties, responsibilities, and assignments of your Qualification Petty Officers. Your PQS program cannot survive without good planning and quality control.

B. The estimated completion time, shown at the beginning of each Watchstation/Workstation, is only a recommendation and may be modified by the command. It indicates how long it will take the average sailor under normal conditions to complete each Watchstation/Workstation.

## VI. THE QUALIFICATION PETTY OFFICER

A. Selection as a Qualification Petty Officer means that you are one of the command's subject matter experts on those Fundamentals, Systems and Watchstations/Workstations assigned to you. PQS cannot be successful without you. Your job is to be totally knowledgeable in your assigned areas, to make yourself available to check off your trainees' achievements, and to ensure that a high-quality PQS program is maintained in your division.

B. Each Qualification Petty Officer should have a set of standard answers for the Watchstations/Workstations so that all trainees receive the same answer. If multiple signatures are required for a line item, it is preferable that one working day or one watch elapse between signatures. If the trainee does not know the correct answer, it is your responsibility to help find the answer in the reference material. This will speed up the process of qualification and will familiarize your trainees with the use of publications. Obviously, this requires that you know where all the answers can be found.

C. As the Qualification Petty Officer you will be the most likely individual to discover discrepancies in the Standard booklet. Any discrepancies noted should be brought to the attention of your supervisor so that appropriate tailoring and corrections can be made. It must be understood that the PQS booklet should be tailored to fit your command's needs. Such tailoring is to be accomplished only with approval of your Commanding Officer or a designated official.

## DEFINITIONS OF WORDS USED IN PQS

AIRCREW EVOLUTION - A grouping of aircrew tasks that measure performance in the course of a flight

COMPONENTS - Major units that make up a system when properly connected

COMPONENT PART - A major part of a component

CONTROL SIGNAL - A signal used to control electronic or mechanical devices

EMERGENCY - An event or series of events in progress that will cause damage to equipment or personnel unless immediate corrective steps are taken

FUNDAMENTALS - Basic facts, theories, laws or principles (100 Section in PQS)

INTERLOCK - A protective device to prevent the unsafe operation of equipment or to sequence the action of systems, components or component parts

MAINTENANCE ACTION - A maintenance technician qualification that measures ability to perform a designated task

MAINTENANCE OPERATION - A qualification that measures the ability to perform tasks (using established procedures) to determine the need for maintenance

NORMAL OPERATING VALUE - The point at which satisfactory performance may be expected

PARAMETER - A variable (temperature, pressure, flow rate, voltage, current, frequency etc.) that must be indicated, monitored, checked or sensed during operation or testing

PROTECTIVE FEATURE - A device designed to prevent damage or injury

SENSING POINT - The point in a system at which a signal may be detected

SETPOINT - The value of a parameter at which: (a) an alarm is set off, (b) operator action is required, (c) valves open or shut, (d) proper operation stops and damage may occur, or (e) the optimum value for normal operation

SUPPORT ACTION - A qualification that measures the ability to perform specific or repetitive tasks that do not involve the correction of a malfunction or repair of equipment

SYSTEMS - Groups of components that operate together to perform specific functions (200 Section in PQS)

SYSTEM INTERFACE - (a) How outside influences affect the operation of this system, or (b) How the operation of this system affects the operation of other systems or equipment

TOLERANCES - Maximum and minimum allowable values of a parameter

WATCHSTATION/WORKSTATION - An operator qualification that includes duties, assignments or responsibilities that an individual may be called upon to perform (not necessarily limited to a specific time period)





### CONTRIBUTING FLEET PERSONNEL

The following personnel, under the supervision of the PQS Development Group, made a significant contribution to the development of this PQS for LKA-113 Class Engineering Officer of the Watch (E00W) (Qual OA):

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USS EL PASO (LKA-117)  
USS ST LOUIS (LKA-116)



## FUNDAMENTALS AND SYSTEMS SUMMARY

### FUNDAMENTALS

		<u>SIGNATURE</u>	<u>DATE</u>
0101	Mechanical	_____	_____
0102	Boiler	_____	_____
0103	Electrical	_____	_____
0104	Engineering Administration	_____	_____
0105	Engineering Safety Precautions	_____	_____

### SYSTEMS

0201	Basic Steam Cycle	_____	_____
0202	600 PSI (V2 M8) Boiler	_____	_____
0203	Combustion Air	_____	_____
0204	600 PSI Main Steam	_____	_____
0205	600 PSI Desuperheated Steam	_____	_____
0206	150 PSI Auxiliary Steam	_____	_____
0207	Steam Atomizing	_____	_____
0208	Auxiliary Exhaust	_____	_____
0209	Propulsion Turbines and Reduction Gears	_____	_____
0210	Main Shafting, Bearings and Propeller	_____	_____
0211	Main Lube Oil Service and Purification	_____	_____
0212	Main Condenser Seawater-Circulating	_____	_____
0213	Gland Exhaust	_____	_____
0214	Ship's Service Turbogenerator (SSTG)	_____	_____
0215	Auxiliary Condenser Seawater-Circulating	_____	_____
0216	High-Pressure (HP) and Low-Pressure (LP) Drain	_____	_____
0217	Main Feed	_____	_____

## SYSTEMS (CONT'D)

		<u>SIGNATURE</u>	<u>DATE</u>
0218	Main and Auxiliary Condensate	_____	_____
0219	Fuel Oil Service	_____	_____
0220	Main and Secondary Drainage	_____	_____
0221	Firemain	_____	_____
0222	Auxiliary Machinery Cooling Water	_____	_____
0223	Flash-Type Distilling Plant	_____	_____
0224	Low-Pressure (LP) Air	_____	_____
0225	Main and Auxiliary Air Ejectors	_____	_____
0226	High-Pressure (HP) Air	_____	_____
0227	Throttle Control Console	_____	_____
0228	Oily Water Separator	_____	_____
0229	Boiler Console	_____	_____
0230	No-Break Power Supply	_____	_____
0231	Ship's Service Switchboard Control Unit	_____	_____
0232	Alternating-Current (AC) Ship's Service Distribution	_____	_____
0233	Impressed-Current Cathodic Protection	_____	_____
0234	Electrohydraulic Steering	_____	_____
0235	JP-5 Transfer and Service	_____	_____
0236	Ship's Service Diesel Generator (SSDG)	_____	_____

## References:

- a. Fireman (NAVEDTRA 10520)
- b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- c. Machinist's Mate 1 & C (NAVEDTRA 10525)
- d. Boiler Technician 3 & 2 (NAVEDTRA 10535)
- e. Boiler Technician 1 & C (NAVEDTRA 10536)

- .1 State the major parts, the function of each major part and the shipboard use of each of the following valves:
  - a. Globe
  - b. Gate
  - c. Check (lift-, ball- and swing)
  - d. Plug
  - e. Pressure reducing
  - f. Unloading (dumping)
  - g. Thermostatically controlled recirculating
  - h. Relief
  - i. Sentinel
  - j. Needle
  - k. Air-operated
  - l. Solenoid
  - m. Ball
- .2 State the major parts, the function of each major part and a shipboard application of the following pumps:
  - a. Reciprocating
  - b. Rotary
  - c. Centrifugal
  - d. Jet
  - e. Propeller
- .3 Describe the construction and uses of the following instruments:
  - a. Pressure gauges
  - b. Vacuum gauges
  - c. Compound gauges
  - d. Thermometers and pyrometers
  - e. Liquid level indicators
  - f. Fluid flowmeters
  - g. Revolution counters and indicators
- .4 Describe the principles of operation and use of an orifice in a steam drain line.
- .5 Describe the construction and uses of the following types of steam traps:
  - a. Mechanical
  - b. Thermostatic
  - c. Thermodynamic
  - d. Bimetallic

MECHANICAL FUNDAMENTALS (CONT'D)

- .6 Describe the construction, principles of operation and uses of the following:
- a. Speed-limiting governor
  - b. Constant-pressure governor
  - c. Automatic shutdown device
- .7 Describe the construction, principles of operation and uses of impulse and reaction turbines.
- .8 Define the following terms as applied to engineering:
- |                      |                              |
|----------------------|------------------------------|
| a. Light off         | n. Warm up                   |
| b. Cross-connect     | o. Recirculation/circulation |
| c. Standby           | p. Split out                 |
| d. Top off           | q. Parallel                  |
| e. Absolute pressure | r. Cut in                    |
| f. Gauge pressure    | s. Cut out                   |
| g. Bypass            | t. Settle out                |
| h. Cold iron         | u. Viscosity                 |
| i. Condensation      | v. Condensate depression     |
| j. Vaporization      | w. Submergence control       |
| k. Start             | x. Dewpoint                  |
| l. Secure            | y. Sensible heat             |
| m. Line up           | z. Latent heat               |
- .9 Define the following as applied to turbines:
- a. Impulse
  - b. Reaction
  - c. Staging
  - d. Axial flow
  - e. Double-axial flow
  - f. Kinetic/potential energy
  - g. Axial thrust
  - h. Steam expansion
  - i. Nozzle
  - j. Radial flow
  - k. Helical flow
  - l. Velocity compounding
  - m. Pressure compounding
  - n. Rateau stage
  - o. Curtis stage
- .10 Describe the possible operating problems of centrifugal pumps, including probable causes.
- .11 Define the following as applied to pumps:
- a. Power end
  - b. Fluid end
  - c. Head
  - d. Net positive suction head (NPSH)
  - e. Suction head
  - f. Discharge head
  - g. Total head

0101     MECHANICAL FUNDAMENTALS (CONT'D)

- .12 Describe the basic applications of heat exchangers.
- .13 Describe the function and basic construction of an air ejector.
- .14 State the functions of the following turbine safety devices:
  - a. Overspeed trip
  - b. Back-pressure trip
  - c. Low lube oil pressure trip
  - d. Emergency hand trip
  - e. Speed-limiting governor
  - f. Constant-pressure governor
- .15 State the purpose of gears in terms of changing speed and direction, and type of motion of shafts.
- .16 State the purpose of the shaft-turning gear.
- .17 Discuss proper care of reduction gears in relation to the following:
  - a. Lubrication
  - b. Locking and unlocking the shaft
  - c. Noise and vibration
  - d. Extended layup
- .18 State how the following factors contribute to the efficient and economical operation of the engineering plant:
  - a. Steam pressure
  - b. Vacuum
  - c. Fuel oil pressure
  - d. Lube oil temperature
  - e. Superheat temperature
  - f. Condensate depression
  - g. Economizer
  - h. Clean heat exchanger surfaces

## References:

- a. Fireman (NAVEDTRA 10520)
- b. Boiler Technician 3 & 2 (NAVEDTRA 10535)
- c. Boiler Technician 1 & C (NAVEDTRA 10536)
- d. Naval Ships' Technical Manual, Chap 221 (NAVSEA S9086-GY-STM-000)

## .1 Explain the following terms as applied to boilers:

- a. Fire sides
- b. Water sides
- c. Combustion
- d. Operating pressure
- e. Superheated steam
- f. Desuperheated steam
- g. Saturated steam
- h. PSI
- i. Steam generator
- j. Conduction
- k. Radiation
- l. Convection
- m. Shrink
- n. Swell
- o. Boiler load
- p. Atomization (steam)
- q. Sensible heat
- r. Latent heat
- s. British thermal unit (Btu)
- t. Combustion units
- u. Stack

## .2 Explain how the following equipment/devices are used:

- a. Burner assembly
- b. Soot blowers
- c. Superheater
- d. Generating tubes
- e. Water screen tubes
- f. Water drum
- g. Steam drum
- h. Headers
- i. Economizer
- j. Air casing
- k. Water level indicators and gauge glasses
- l. Gas baffles
- m. Refractory
- n. Sidewall tubes
- o. Desuperheater



0102     BOILER FUNDAMENTALS (CONT'D)

- .3 Explain the protective functions of the following:
  - a. Safety valves
  - b. Refractory
  - c. Superheater protection steam
  - d. Steam smothering system
  - e. Shutters
  - f. Quick-closing valve
  - g. Safety shutoff device
  - h. Sliding feet
- .4 Explain the following terms associated with boiler operation:
  - a. Bottom blowdown
  - b. Surface blowdown
  - c. Blowing tubes
  - d. Lighting off
  - e. Secure
  - f. Black smoke
  - g. White smoke
  - h. Auto/remote manual/local manual
- .5 State the four phases of the basic steam cycle.
- .6 Describe the relationship between pressure, temperature and volume in a boiler in which steam has begun to form.
- .7 State the three basic methods of heat transfer, including how they interact.
- .8 Describe the principle of combustion in the boiler in terms of air requirements, fuel oil atomization and products of combustion.

## References:

- a. Navy Electricity and Electronics Introduction to Circuit Protection, Control, and Measurement (Module 3) (NAVEDTRA 172-03-00-79)
- b. Electrician's Mate 3 & 2 (NAVEDTRA 10546)
- c. IC Electrician 3 (NAVEDTRA 10559)
- d. IC Electrician 2 (NAVEDTRA 10555)
- e. Shipboard Electrical Systems (NAVEDTRA 10864)
- f. Naval Ships' Technical Manual, Chap 300 (NAVSEA S9086-KC-STM-000)
- g. Naval Ships' Technical Manual, Chap 302 (NAVSEA S9086-KE-STM-000)
- h. Naval Ships' Technical Manual, Chap 310 (NAVSEA S9086-KN-STM-000)
- i. Naval Ships' Technical Manual, Chap 320 (NAVSEA S9086-KY-STM-000)

## .1 Describe the function and application of each of the following:

- a. Voltage tester
- b. Ammeter
- c. Voltmeter
- d. Wattmeter
- e. Stroboscope
- f. Synchroscope
- g. Tachometer
- h. Frequency meter
- i. Transformer
- j. Voltage regulator
- k. Reverse-power relay
- l. Controllers (LVR/LVP)
- m. Fuses
- n. Distribution panels
- o. Circuit breakers
- p. Switchboard
- q. Bus transfer switches (automatic/manual)
- r. Voltage-adjusting rheostat (automatic/manual)
- s. Governor motor control rheostat
- t. Kilowattmeter
- u. Meter selector switches
- v. Power available lights
- w. Breaker position lights
- x. Droop switch
- y. Coil temperature meter
- z. Heater switches
- aa. Ground detector lights
- ab. Phase-sequence meter

## .2 Define the following terms used in electrical theory:

- a. Voltage
- b. Current
- c. Ampere
- d. Power factor
- e. Watt
- f. Resistance/ohm
- g. Electrical load
- h. Generator

ELECTRICAL FUNDAMENTALS (CONT'D)

- i. Armature/stator
  - j. Field/rotor
  - k. Prime mover
  - l. Field excitation
  - m. Parallel/split plant generator operation
  - n. Synchronous
  - o. Droop
  - p. Manual bus transfer (MBT)
  - q. Automatic bus transfer (ABT)
  - r. Hertz
  - s. Phase
  - t. LVR
  - u. LVP
  - v. Selective tripping
- 
- .3 Explain the basic principle of electrical power generation.
  - .4 Explain the relationship between current, voltage and resistance.
  - .5 Explain the difference between an ungrounded distribution system and a grounded distribution system.
  - .6 Describe the effects of a zero ground on an ungrounded system and on a grounded system.
  - .7 Discuss the procedures for hooking up shore power.
  - .8 Discuss the procedures for hooking up and removing casualty power.

## References:

- a. Navy Safety Precautions for Forces Afloat (OPNAVINST 5100.19)
  - b. Standard Organization and Regulations of the U.S. Navy (OPNAVINST 3120.32)
  - c. Naval Ships' Technical Manual, Chap 9450 (New 262) (NAVSEA 0901-LP-450-0002)
  - d. Naval Ships' Technical Manual, Chap 541 (NAVSEA S9086-SN-STM-000)
- .1 Discuss the steaming auxiliary/underway watch organization and define the duties/responsibilities of each watchstander.
- .2 Describe the following as applied to the equipment safety tag-out system:
- a. Duties of authorizing officer, person attaching tag, person checking tag and repair activity
  - b. Use of caution tag
  - c. Use of danger tag
  - d. Preparation of tags and record sheets
  - e. Function of independent tag coverage checks by petty officer in charge of work and second person
  - f. Location and custody of tagout log and software
  - g. Function and use of instrument log
- .3 Discuss the function, required information and supervisory review requirements for the following:
- a. Engineering smooth log
  - b. Bell sheets
- .4 Discuss the following as applied to heat stress:
- a. Situations requiring heat survey
  - b. Personnel exposure limits
  - c. Procedures for treating victims of heat exhaustion or heat stroke
  - d. Procedures for monitoring ambient space temperatures
- .5 State the following as applied to fuel oil/lube oil management:
- a. Bottom sediment and water (BS&W) limits for fuel oil/lube oil
  - b. BS&W testing frequency for fuel oil/lube oil
  - c. Lube oil sampling frequency and standard comparison
  - d. BS&W and fuel oil/lube oil logs

## References:

- a. Boiler Technician 3 & 2 (NAVEDTRA 10535)
  - b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
  - c. Navy Safety Precautions for Forces Afloat (OPNAVINST 5100.19)
  - d. Standard Organization and Regulations of the U.S. Navy, (OPNAVINST 3120.32)
  - e. Naval Ships' Technical Manual, Chap 300 (NAVSEA S9086-KC-STM-000)
  - f. Naval Ships' Technical Manual, Chap 593 (NAVSEA S9086-T8-STM-000)
  - g. Accident Prevention Manual (OPNAVINST 5101.2)
  - h. Accident Investigation and Reporting (OPNAVINST 5102.1)
  - i. Heat Stress Analysis Program (OPNAVINST 5100.20)
  - j. Hearing Conservation Program (BUMEDINST 6260.2)
  - k. Naval Ships' Technical Manual, Chap 9450 (New 262) (NAVSEA 0901-LP-450-0002)
- .1 Draw a simple diagram of machinery locations, indicating access and escape routes in your space.
  - .2 Describe where safety precautions are posted on machinery and throughout the space.
  - .3 Explain the use and protective functions of the following:
    - a. Relief valves
    - b. Safety valves
    - c. Lagging
    - d. Flange covers/shields
    - e. Reach rod
    - f. Coupling covers
    - g. Electrical light steamtight covers
    - h. Recirculating valve
    - i. Quick-closing valve
    - j. Speed-limiting governor
    - k. Constant-pressure regulator
    - l. Remote-operated control valves (air/hydraulic)
    - m. Valve-locking device
  - .4 Describe the safety precautions to follow when working with high-speed rotating machinery.
  - .5 Discuss the importance of bolted deckplates, gratings and handrails.
  - .6 Discuss the importance of good housekeeping practices in engineering spaces.
  - .7 Describe the danger of skylarking in machinery spaces.
  - .8 Explain the hazards caused by improper tightening of valve bonnet and packing gland nuts.
  - .9 Explain the hazard of oil in the bilges.
  - .10 Describe the safety precautions to follow prior to and when entering a void or poorly ventilated space.

- .11 Describe the protection provided by the following safety equipment and state examples of ship's evolutions that require their use:
  - a. Long-sleeved shirts
  - b. Hardhats
  - c. Goggles/face masks
  - d. Gloves
  - e. Safety shoes
  - f. First-aid boxes
  - g. Stretchers
  - h. Life jackets
  - i. Safety harness
  - j. Ear protectors (plugs)
- .12 State the purpose and correct use of rubber mats and rubber aprons as safety equipment when performing hazardous tasks.
- .13 Describe the safety precautions to follow when operating a compressed air system.
- .14 Describe the safety precautions to follow when using the following:
  - a. Calcium hypochlorite
  - b. Solvents
  - c. Caustic soda
  - d. Mercuric nitrate
- .15 Explain the oily waste discharge limitations as they apply to shipboard personnel.
- .16 Describe the procedures required in the event of an oil spill.
- .17 Explain the special hazards of and procedures for working on a pressure system component.
- .18 Explain the special hazards of and procedures for working on a system that opens to the sea.
- .19 Discuss the safety precautions to be observed and/or personnel safety equipment/devices required in the following situations (as set forth in OPNAVINST 5100.19):
  - a. During replenishment-at-sea operations (Chap 2, Sec III)
  - b. When working aloft (Chap 2, Sec V)
  - c. During heavy weather (Chap 2, Sec VI)
  - d. While working with paint (Chap 10, Sec IV)
  - e. While working with electrical/electronic equipment (Chap 5, Sec I)
  - f. While operating portable electric tools (Chap 5, Sec II)
  - g. While welding, cutting and brazing (Chap 6)
  - h. During operations of main and auxiliary steam turbines (Chap 7, Sec IV)
  - i. While working with workshop equipment (Chap 9, Sec I through III)
  - j. While handling hazardous material (Chap 10, Sec I through VI)

0105     ENGINEERING SAFETY PRECAUTIONS FUNDAMENTALS (CONT'D)

- .20 Discuss the hazards of oil fires (as set forth in OPNAVINST 5100.19, Chap 3, Sec I through III).
- .21 Discuss first aid for electrical shock (as set forth in OPNAVINST 5100.19, Chap 5, Sec III).
- .22 Describe the eight basic accident cause factors as defined in the Accident Prevention Manual.
- .23 Define systems safety.
- .24 Discuss the Heat Stress Analysis Program (as set forth in OPNAVINST 5100.20) and the following associated terms:
  - a. Wet bulb
  - b. Dry bulb
  - c. Radiant heat
  - d. WBGT
  - e. Physiological heat exposure limit (PHEL)
  - f. Safe stay time
- .25 Discuss the following programs:
  - a. Hearing Conservation Program (BUMEDINST 6260.2)
  - b. Lube Oil Quality Control Program (LOQCP) (OPNAVINST 3120.32)
- .26 Discuss the various kinds of accident investigations and how they differ.
- .27 Describe the reports required for personnel injuries, fatalities, lost workdays and various kinds of material/property damage.

0201 BASIC STEAM CYCLE SYSTEM

0201

## References:

- a. Fireman (NAVEDTRA 10520)

0201.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0201.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the safety/protective devices for this component/  
component part?

	A	B	C	D
.21 Boiler	X	X		X
.22 Superheater	X	X		X
.23 High-pressure (HP) turbine	X	X	X	X
.24 Low-pressure (LP) turbine	X	X	X	X
.25 Main condenser	X	X		X
.26 Condensate pump	X	X	X	X
.27 Air ejector	X	X	X	X
.28 Deaerating feed tank (DFT)	X	X		X
.29 Main feed booster pump	X	X	X	X
.210 Main feed pump	X	X	X	X
.211 LP feed heater	X	X		
.212 Gauges	X	X		
.213 Thermometer	X	X		
.214 Economizer	X	X		X

0201.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of working fluid (water/steam) from the boiler outlet to the steam drum.

0201.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

- .41 Main steam temperature/pressure
- .42 Main condensate temperature/pressure
- .43 Main feed temperature/pressure



0201.5 \* SYSTEM INTERFACE - None to be discussed.

0201.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

## References:

- a. Naval Ships' Technical Manual, Chap 221 (NAVSEA S9086-GY-STM-000)
- b. Boiler Technician 3 & 2 (NAVEDTRA 10535)
- c. Manufacturer's Technical Manual

0202.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0202.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/  
component part?
- D. What protection is provided by this component/component part?

	A	B	C	D
.21 Economizer	X	X	X	
.22 Steam drum	X	X	X	
.23 Superheater	X	X	X	
.24 Desuperheater	X	X	X	
.25 Generating tubes	X	X	X	
.26 Water screen tubes	X	X		X
.27 Downcomer tubes	X	X		
.28 Water drum	X	X		
.29 Safety valves	X	X		X
.210 Hand easing gear	X	X		X
.211 Boiler water level indicators	X	X	X	X
.212 Furnace	X	X		
.213 Air register	X	X		
.214 Air casing	X	X	X	X
.215 Flame failure alarm	X	X		X
.216 Smoke indicator	X	X		X
.217 Forced-draft blowers (FDBs)	X	X		
.218 Boiler blowdown valves/piping	X	X		X
.219 Soot blowers	X	X		X

0202.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

#### 0202.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Steam drum pressure	X	X	X	
.42 Superheater outlet pressure	X	X	X	
.43 Superheater outlet temperature	X	X	X	
.44 Safety valve settings	X	X	X	
.45 Steam drum water level	X	X	X	X
.46 Flame failure alarm setting			X	X
.47 Smoke	X	X	X	
.48 Economizer outlet temperature	X	X	X	
.49 Economizer inlet temperature	X	X	X	
.410 Desuperheater temperature	X	X	X	
.411 Desuperheater pressure	X	X	X	

#### 0202.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in feed pressure/temperature
  - b. Loss of fuel oil service pressure
  - c. Loss of combustion air

#### 0202.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0203 COMBUSTION AIR SYSTEM

0203

## References:

- a. Manufacturer's Technical Manual (NAVSEA 0935-006-0010)

0203.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0203.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?
- E. What are the safety/protective devices for this component/component part?
- F. What are the probable indications if this component fails?
- G. What is the source of control signals?

.21 Automatic shutter

.22 Electric motor

.23 Forced-draft blower (FDB) inlet  
vane-operator

.24 FDB

A	B	C	D	E	F	G
X	X		X		X	
X	X	X	X	X	X	
	X	X	X	X	X	X
	X	X			X	

0203.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of air from the inlet vanes to the burner air register.
- .33 What indications will you receive if the system is malfunctioning?

0203.4 PARAMETERS - None to be discussed.0203.5 SYSTEM INTERFACE

- .51 How does this system interface with the following:

- a. 600 PSI Main Steam System
- b. 600 PSI Desuperheated Steam System

0203.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)
- b. Propulsion Operating Guide (POG)
- c. Propulsion Plant Manual (PPM)
- d. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- e. Boiler Technician 3 & 2 (NAVEDTRA 10535)

0204.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0204.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/  
component part?
- D. What protection is provided by this component/component part?

		A	B	C	D
.21	Main steam strainer	X	X		X
.22	Main engine ahead and astern guarding valves	X	X		X
.23	Astern/ahead throttle valve	X	X	X	X
.24	Piping and steam valves	X	X	X	
	a. Main steam bypass valves	X	X		X
	b. Trap/orifice drain manifolds	X	X		
	c. Main steam bonnet drains	X	X		
	d. Main steam valve operators (toggles/motors)	X	X	X	
	e. Root steam valve	X	X		
	f. Main steam line stop (guarding) valve	X	X		
	g. Main steam line expansion joint	X	X		
.25	Main steam hangers	X	X		
.26	Gauges	X	X		
.27	Thermometers	X	X		

0204.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of main steam from:
  - a. The boiler to the main condenser.
  - b. The boiler to the auxiliary condenser.
- .33 What indications will you receive if the system is malfunctioning?

#### 0204.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

.41 Main steam pressure

#### 0204.5 SYSTEM INTERFACE

.51 How do the following outside influences affect this system:

- a. Variations in boiler firing rate
- b. Variations in boiler temperature/pressure

.52 How does this system interface with the following:

- a. Propulsion Turbines and Reduction Gears System
- b. Ship's Service Turbogenerator (SSTG) System
- c. Main Feed System

#### 0204.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

.62 What safety precautions apply to locating steam leaks?

## References:

- a. Propulsion Operating Guide (POG)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)

0205.1    What is the function of this system?

- .11    Refer to a standard print of this system or to the actual equipment.

0205.2    SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the probable indications if this component fails?

	A	B	C
.21    Cutout valves to 150 PSI reducer	X	X	X
.22    Bypass valves to 150 PSI reducer	X	X	X
.23    Root steam/guarding valves to auxiliary machinery		X	X
.24    Drains		X	X
.25    Gauges		X	X
.26    Thermometers		X	X

0205.3    PRINCIPLES OF OPERATION

- .31    How do the components work together to achieve the system's function?
- .32    Using a diagram of the system, show the path of steam from:
- a. The desuperheater to the auxiliary machinery.
  - b. The desuperheater to the reducer.

0205.4    PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41    Steam temperature
- .42    Steam pressure

0205.5 SYSTEM INTERFACE

.51 How do the following outside influences affect this system:

- a. Variations in 150 PSI steam pressure
- b. Variations in auxiliary exhaust pressure
- c. Variations in boiler firing rate

0205.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?



## References:

- a. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)
- b. Propulsion Operating Guide (POG)

0206.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0206.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What protection is provided by this component/component part?

- .21 Steam blanket valves and piping
- .22 Relief valves
- .23 600/150 PSI reducer
- .24 Shore steam connection
- .25 Steam atomization valves and piping
- .26 Steam-smothering valves and piping
- .27 Ship's whistle valves and piping
- .28 Gland seal valves and piping

0206.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0206.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 150 PSI auxiliary steam pressure
- .42 150 PSI auxiliary steam temperature

0206.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:

- a. Operation of Main Feed System
- b. Operation of Auxiliary Exhaust System

0206.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Ship's Information Book (SIB)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)

0207.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0207.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What protection is provided by this component/component part?
- D. What are the probable indications if this component fails?
- E. What are the positions and functions of each position?

	A	B	C	D	E
.21 In-line desuperheater	X	X		X	
.22 Steam separator	X	X		X	
.23 Safety shutoff valve	X	X	X	X	X
.24 Root valve	X	X			
.25 Piping	X	X			

0207.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of atomizing steam from the desuperheater to the atomizer.
- .33 What indications will you receive if the system is malfunctioning?

0207.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 Atomizing steam pressure
- .42 Atomizing steam temperature

0207.5 SYSTEM INTERFACE

- .51 How does this system interface with the following:
- a. Fuel Oil Service System
  - b. 150 PSI Auxiliary Steam System

0207.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0208 AUXILIARY EXHAUST SYSTEM

0208

## References:

- a. Propulsion Operating Guide (POG)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)

0208.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0208.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?
- D. What protection is provided by this component/component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Relief valves	X	X		X	
.22 Combination and exhaust/relief valve	X	X	X		X
.23 Atmospheric relief valve	X	X		X	
.24 Unloading valve to main/auxiliary condenser	X	X	X	X	X
.25 Exhaust steam valve to evaporators	X	X			
.26 Auxiliary exhaust augmenting valve	X	X	X	X	X
.27 Gauges	X	X			
.28 Thermometers	X	X			

0208.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0208.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 Atmospheric relief valve pressure
- .42 Unloading valve pressure to main/auxiliary condenser
- .43 Combination exhaust relief valve pressure
- .44 Exhaust augmenting station pressure
- .45 Exhaust supply to distilling plant pressure

0208.5 SYSTEM INTERFACE

.51 How do the following outside influences affect this system:

- a. Operation of auxiliary machinery
- b. Loss of low-pressure (LP) air
- c. Variations in high-pressure (HP) drain pressure

0208.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

## References:

- a. Naval Ships' Technical Manual, Chap 231 (NAVSEA 0901-LP-411-0002)
- b. Naval Ships' Technical Manual, Chap 252 (NAVSEA 0901-LP-420-0002)
- c. Propulsion Operating Guide (POG)
- d. Propulsion Plant Manual (PPM)
- e. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- f. Westinghouse Main Turbine (NAVSEA 0941-020-1010)

0209.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0209.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?
- E. What are the safety/protective devices for this component/  
component part?
- F. What are the probable indications if this component fails?
- G. What is the source of control signals?
- H. What are the positions and functions of each position?

	A	B	C	D	E	F	G	H
.21 High-pressure (HP) turbine	X	X						
a. Nozzles, valves and operating gear	X	X						
b. Intermediate bleeder steam system	X	X	X	X	X	X	X	
c. Casing drains	X	X						
d. Sentinel valves	X	X				X		
.22 Low-pressure (LP) turbine	X	X						
a. Rotor position indicator	X	X			X			
b. Sentinel valves	X	X				X		
c. LP bleeder steam piping and valves	X	X	X	X		X	X	X
.23 Astern turbine	X	X			X			
.24 Exhaust trunk	X	X			X			
.25 Reduction gear	X	X			X			
.26 Turning gear	X	X	X					
.27 Inspection cover	X	X						
.28 Sight flow indicators	X	X				X		
.29 Vent fog precipitator	X	X	X			X		
.210 Security devices	X	X						
.211 Main line stop (MS 3)	X	X						
.212 Astern guarding valves	X	X	X	X	X	X	X	X
.213 Ahead guarding valves	X	X	X	X	X	X	X	X
.214 Crossunder piping	X	X						
.215 Engine revolution indicator	X	X	X					

## 0209.2 SYSTEM COMPONENTS AND COMPONENT PARTS (CONT'D)

	A	B	C	D	E	F	G	H
.216 Tachometer	X	X	X			X		
.217 Turbine glands (labyrinth seals)	X	X						
.218 Ahead throttle valve	X	X						
.219 Wrong-direction alarm	X	X					X	
.220 Astern throttle valve	X	X						
.221 Main condenser	X	X				X	X	
.222 Gauges	X	X						
.223 Thermometers	X	X						

## 0209.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of steam from the guarding valve to the main condenser.

## 0209.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Main steam pressure to HP turbine	X	X	X	
.42 Astern turbine steam pressure	X	X	X	
.43 Steam pressure to LP turbine	X	X	X	
.44 Lube oil pressure	X	X	X	X
.45 LP turbine exhaust temperature	X	X	X	X
.46 Gland seal steam pressure	X	X	X	
.47 Main steam pressure to LP turbine	X	X	X	

## 0209.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in main steam pressure
  - b. Variations in main lube oil pressure and temperature
  - c. Loss of/excessive steam to Main Gland Seal Steam System
- .52 How does this system interface with the following:
  - a. Main Lube Oil System
  - b. 600 PSI Main Steam System
  - c. Main Shafting, Bearings and Propeller System
  - d. Main and Auxiliary Air Ejector System
  - e. Main Gland Seal Steam System

## 0209.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Naval Ships' Technical Manual, Chap 9430 (New 243)  
(NAVSEA 0901-LP-430-0012)
- b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- c. Naval Ship's Technical Manual, Chap 244 (NAVSEA S9086-HN-STM-000)

0210.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0210.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What protection is provided by this component/component part?
- D. What are the probable indications if this component fails?

	A	B	C	D
.21 Main shaft	X	X		
a. Stern tube shaft	X	X		X
.22 Lineshaft bearing	X	X		X
a. Oil sump	X	X		X
b. Oil slinger rings or oil disc	X	X		X
c. Bearing housing	X	X		
d. Oil dipstick	X	X		
e. Oil drain and fill plugs	X	X		
.23 Bulkhead stuffing box	X	X	X	X
.24 Stern tube seal assembly	X	X	X	X
a. Flushing valve	X	X		
b. Drain valve	X	X		
c. Syntron seal	X	X	X	X
d. Inflatable seal rings	X	X	X	X
.25 Propeller	X	X		X
.26 Stern tube bearing	X	X		X
.27 Fairwater shield	X	X		X
.28 Stern tube sealing and flushing water piping and valve	X	X		X
.29 Strut bearing	X	X		X

0210.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 What indications will you receive if the system is malfunctioning?



#### 0210.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Bearing oil level	X	X	X	
.42 Bearing temperature	X	X	X	X
.43 Sealing water pressure	X	X	X	

#### 0210.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in rudder position
  - b. Variations in engine speed
- .52 How does this system interface with the main reduction gear?

#### 0210.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?
- .62 What special safety precautions apply to:
  - a. Stern tube seal assembly
  - b. Shaft line bearings

## References:

- a. Ship's Information Book (SIB)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)
- c. Manufacturers' Technical Manuals (NAVSEA 0947-098-0010) and  
(NAVSEA 0947-076-9010)

0211.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0211.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?
- E. What are the safety/protective devices for this component/  
component part?
- F. What protection is provided by this component/component part?
- G. What are the probable indications if this component fails?
- H. What is the source of control signals?

	A	B	C	D	E	F	G	H
.21 Main lube oil sump	X	X						
.22 Electric lube oil pumps	X	X	X	X	X	X	X	X
.23 Attached lube oil pump	X	X	X					X
.24 Main lube oil strainers	X	X		X				X
.25 Main lube oil cooler	X	X						X
.26 Spring-loaded relief valve	X	X				X	X	
.27 Unloading valve	X	X				X	X	
.28 Purifier	X	X	X		X			X
.29 Lube oil storage tanks	X	X						
.210 Lube oil settling tanks	X	X						
.211 Main lube oil strainer covers	X	X						
.212 Flange shields	X	X				X		
.213 Sight flow indicators	X	X						X
.214 Main lube oil heaters	X	X						
.215 Turbine reduction gear bearings	X	X						X
.216 Vent fog precipitator	X	X	X					
.217 Pump selector switch	X	X	X	X				X

### 0211.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of lube oil from the sump through the system and back to the sump.
- .33 What indications will you receive if the system is malfunctioning?

### 0211.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

	A	B	C
.41 Lube oil pump discharge pressure	X	X	X
.42 Lube oil temperature from cooler	X	X	X
.43 Strainer differential pressure	X	X	X
.44 Lube oil sump level	X	X	X
.45 Emergency lube oil pump start pressure	X	X	X
.46 Purifier outlet temperature	X		X
.47 Relief valve lifting pressure	X		
.48 Low lube oil alarm setting	X		

### 0211.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in shaft speed
  - b. Variations in seawater temperature
  - c. Loss of electrical power
- .52 How does this system interface with the Propulsion Turbines and Reduction Gears System?

### 0211.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?
- .62 What special safety precautions apply to valves locked open and shut?

0212

MAIN CONDENSER SEAWATER-CIRCULATING SYSTEM

0212

## References:

- a. Naval Ships' Technical Manual, Chap 254 (NAVSEA S9086-HY-STM-000)
- b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- c. Propulsion Operating Guide (POG)
- d. Manufacturer's Technical Manual (NAVSEA 0947-076-9010)

0212.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0212.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/  
component part?
- D. What protection is provided by this component/component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Main circulating pump	X	X			X
a. Suction valve	X	X			
b. Swing check valve	X	X		X	X
c. Emergency bilge suction valve	X	X			
.22 Scoop injection swing check valve	X	X			
.23 Expansion joint	X	X		X	X
.24 Condenser headers	X	X	X		
.25 Main condenser	X	X	X		
.26 Condenser overboard valve	X	X			
.27 Main condenser relief valve	X	X		X	X
.28 Lube oil cooler piping and valves	X	X			
.29 Main condenser header vents and drains	X	X			
.210 Sea chest blowout valve	X	X			
.211 Scoop injection valve	X	X			
.212 Feed heater drain connection	X	X			
.213 Hot well	X	X			
.214 Condensate pump suction connection	X	X			
.215 Air ejector suction connection	X	X			
.216 Condensate recirculation connection (high/low)	X	X			
.217 Makeup feed connection	X	X			
.218 Gauges	X	X			
.219 Thermometers	X	X			

0212.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

#### 0212.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Seawater-circulating pump discharge pressure	X	X	X	
.42 Main condenser inlet header pressure	X	X	X	
.43 Lube oil cooler inlet/outlet temperature	X	X	X	
.44 Main condenser inlet temperature	X	X	X	
.45 Main condenser outlet temperature	X	X	X	X

#### 0212.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in ship's speed
  - b. Loss of electrical power
- .52 How does this system interface with the following:
  - a. Main Condensate System
  - b. Auxiliary Exhaust System
  - c. Propulsion Turbines and Reduction Gears System
  - d. Main and Auxiliary Air Ejectors System
  - e. High-Pressure (HP) and Low-Pressure (LP) Drain System

#### 0212.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0213 GLAND EXHAUST SYSTEM

0213

## References:

- a. Naval Ships' Technical Manual, Chap 9562 (New 255)  
(NAVSEA 0901-LP-562-0012)

0213.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0213.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the safety/protective devices for this component/  
component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Gland exhaust fan	X	X			X
.22 Gland exhaust fan motor	X	X	X		X
.23 Exhaust piping	X	X			
.24 Condenser	X	X		X	X
.25 Seawater piping and valves	X	X			
.26 Low-pressure (LP) feed heater	X	X		X	X
.27 Drain piping	X	X			

0213.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0213.4 PARAMETERS - None to be discussed.0213.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:

- a. Operation of auxiliary machinery
- b. Variations in position of unloading valve
- c. Loss of electrical power

- .52 How does this system interface with the deaerating feed tank (DFT)?

0213.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Manufacturer's Technical Manual
- b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- c. Naval Ships' Technical Manual, Chap 9500 (New 502)  
(NAVSEA 0901-LP-500-0002)
- d. Naval Ships' Technical Manual, Chap 310 (NAVSEA S9086-KN-STM-000)

0214.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0214.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the safety/protective devices for this component/  
component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Turbine	X	X		X	
.22 Reduction gear	X	X			
.23 Alternating-current (AC) generator	X	X			
.24 Gland sealing steam piping and valves	X	X	X	X	X
.25 Lube oil assembly	X	X	X	X	X
.26 Thermometers	X	X			
.27 Gauges	X	X			

0214.3 PRINCIPLES OF OPERATION

.31 How do the components work together to achieve the system's function?

.32 Using a diagram of the system, show the path of:

- a. Lube oil from the sump back to the sump.
- b. Steam from the throttle valve to the auxiliary condenser.

#### 0214.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Bearing oil inlet temperature	X	X	X	
.42 Bearing oil outlet temperature	X	X	X	X
.43 Generator air temperature	X	X	X	X
.44 Control oil pressure	X	X	X	X
.45 Generator speed (RPM)	X	X	X	
.46 Gland seal steam pressure	X	X	X	
.47 Sentinel valve lifting pressure	X	X	X	
.48 Casing relief valve lifting pressure	X	X	X	
.49 Cooling water pressure	X	X	X	X

#### 0214.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in main steam pressure
  - b. Variations in auxiliary condenser vacuum
  - c. Variations in electrical load demand
- .52 How does this system interface with the following:
  - a. Main Steam System
  - b. Ship's Service 60-Hz Electrical Distribution System
  - c. Auxiliary Condenser Seawater-Circulating System

#### 0214.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?



## References:

- a. Naval Ships' Technical Manual, Chap 254 (NAVSEA S9086-HY-STM-000)
- b. Machinist's Mate 3 & 2 (NAVEDTRA 10524)

0215.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0215.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?
- D. What are the safety/protective devices for this component/component part?
- E. What protection is provided by this component/component part?
- F. What are the probable indications if this component fails?
- G. What are the positions and functions of each position?

	A	B	C	D	E	F	G
.21 Auxiliary condenser hot well	X	X					
.22 Auxiliary condenser pumps	X	X	X				
.23 Air ejectors	X	X					
.24 Auxiliary circulating pump	X	X	X				
.25 Manual recirculating valves	X	X					
.26 Condenser fill piping	X	X					
.27 Salinity indicators	X	X			X		
.28 Auxiliary exhaust steam inlet piping	X	X					
.29 Makeup feed piping and valves	X	X					
.210 Sea chest	X	X					
.211 Sea chest blowout connection	X	X					X
.212 Sea suction inlet valve	X	X					
.213 Expansion joints	X	X					
.214 Sea suction piping	X	X					
.215 Auxiliary condenser overboard piping and valves	X	X					
.216 Air cooler seawater inlet/outlet piping and valves	X	X		X	X	X	
.217 Seawater duplex strainers	X	X					X
.218 Lube oil cooler inlet/outlet piping and valves	X	X					
.219 Relief valve	X	X			X	X	
.220 Gauges	X	X					
.221 Thermometers	X	X					

### 0215.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of seawater from the sea suction to the overboard.
- .33 What indications will you receive if the system is malfunctioning?

### 0215.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
.41 Circulating water inlet and outlet temperature	X	X	X	
.42 Seawater inlet/outlet pressure	X	X	X	
.43 Auxiliary condenser vacuum	X	X	X	X
.44 Lube oil cooler inlet/outlet temperature	X	X	X	
.45 Air cooler temperature	X	X	X	
.46 Salinity	X	X	X	X
.47 Auxiliary condenser exhaust trunk temperature	X	X	X	

### 0215.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in ship's service turbogenerator (SSTG) load
  - b. Variations in auxiliary steam pressure
  - c. Loss of electrical power
- .52 How does this system interface with the following:
  - a. Auxiliary Exhaust System
  - b. Ship's Service Turbogenerator (SSTG) System

### 0215.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0216 HIGH-PRESSURE (HP) AND LOW-PRESSURE (LP) DRAIN SYSTEM

0216

## References:

- a. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- b. Boiler Technician 3 & 2 (NAVEDTRA 10535)

0216.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0216.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/component part?
- D. What protection is provided by this component/component part?

	A	B	C	D
.21 Freshwater drain collecting tank	X	X	X	
.22 Freshwater drain collecting tank pumps	X	X		
.23 LP drain piping	X	X		
.24 HP drain piping	X	X		
.25 Relief valves	X	X		X
.26 LP drain cutout valves	X	X		X
.27 HP drain cutout valves	X	X		X
.28 Salinity indicators	X	X		X
.29 HP orifices and steam traps	X	X	X	X
.210 LP orifices and steam traps	X	X	X	X

0216.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of condensate from:
  - a. The freshwater drain collecting tank to the deaerating feed tank (DFT).
  - b. The freshwater drain collecting tank to the auxiliary boiler.
- .33 What indications will you receive if the system is malfunctioning?

#### 0216.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Salinity	X	X	X	X
.42 HP relief valve lifting pressure	X	X		
.43 LP relief valve lifting pressure	X	X		
.44 Drain tank level	X	X	X	
.45 Drain tank pump discharge pressure	X	X	X	

#### 0216.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in condensate drainage to HP steam lines
  - b. Variations in condensate flow to LP drain lines
- .52 How does this system interface with the following:
  - a. Deaerating Feed Tank (DFT) System
  - b. Auxiliary Boiler System

#### 0216.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0217 MAIN FEED SYSTEM

0217

## References:

- a. Propulsion Operating Guide (POG)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)
- c. Ship's Information Book (SIB)

0217.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0217.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?
- D. What are the safety/protective devices for this component/  
component part?
- E. What are the probable indications if this component fails?

- .21 Deaerating feed tank (DFT)
- .22 Main feed booster pump
- .23 Main feed pumps
- .24 Feedwater regulating valves
- .25 Main feed piping and valves
- .26 Emergency feed pump

A	B	C	D	E
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	X		X
X	X			
X	X		X	

0217.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of feedwater from the DFT to the economizer inlet.

0217.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

- .41 Salinity
- .42 Main feed pumps discharge pressure
- .43 Main feed booster pumps discharge  
pressure
- .44 DFT level

A	B	C	D
X	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X

0217.4 PARAMETERS (CONT'D)

- .45 Main feed pump oil temperatures
- .46 DFT upper and lower temperature
- .47 DFT shell pressure
- .48 DFT relief valve lifting pressure
- .49 DFT vacuum breaker setting

A	B	C	D
X	X	X	X
X	X	X	
X	X	X	
X			
X			

0217.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in auxiliary exhaust pressure
  - b. High/low water level in boilers
- .52 How does this system interface with the Auxiliary Exhaust System?

0217.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0218 MAIN AND AUXILIARY CONDENSATE SYSTEM

0218

References:

- a. Ship's Information Book (SIB)
- b. Manufacturer's Technical Manual
- c. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)

0218.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0218.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?

- .21 Condensers
- .22 Hot wells
- .23 Condensate pumps
- .24 Piping and valves
- .25 Air ejectors
- .26 Salinity indicators
- .27 Recirculating valves (thermo/manual)
- .28 Condenser fill piping
- .29 Vacuum drag piping

0218.3 PRINCIPLES OF OPERATION

- .31 Using a diagram of the system, show the path of:

- a. Condensate from the hot wells to the deaerating feed tank (DFT).
- b. Condensate from the DFT to the condensers.

0218.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. What is the physical location of the indicators?

- .41 Condenser vacuum
- .42 Pump discharge pressure
- .43 Condensate salinity

0218.5 SYSTEM INTERFACE

- .51 How do variations in auxiliary exhaust pressure affect this system?

0218.5 SYSTEM INTERFACE (CONT'D)

.52 How does this system interface with the following:

- a. DFT
- b. Main Feed System

0218.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?



## References:

- a. Naval Ships' Technical Manual, Chap 9500 (New 502)  
(NAVSEA 0901-LP-500-0002)
- b. Boiler Technician 3 & 2 (NAVEDTRA 10535)
- c. Propulsion Operating Guide (POG)
- d. Manufacturer's Technical Manual (NAVSEA 0947-098-0010)
- e. Manufacturer's Technical Manual (NAVSEA 0948-059-6010)
- f. Manufacturer's Technical Manual (NAVSEA 0945-010-5010)

0219.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0219.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?
- E. What are the safety/protective devices for this component/component part?
- F. What protection is provided by this component/component part?
- G. What are the probable indications if this component fails?
- H. What is the source of control signals?
- I. What are the positions and functions of each position?
- J. What are the interlocks?

	A	B	C	D	E	F	G	H	I	J
.21 Fuel oil service tanks	X	X			X					
.22 Fuel oil service tanks cutout valves	X	X				X				
.23 Main fuel oil service pumps	X	X	X	X	X					X
.24 Fuel oil strainers	X	X				X	X			
.25 Fuel oil recirculating valve	X	X				X	X			
.26 Fuel oil three-way valves	X	X		X		X		X	X	
.27 Fuel oil quick-closing valves	X	X				X	X			
.28 Burner safety shutoff devices	X	X				X	X			
.29 Contaminated fuel oil tank	X	X								
.210 Fuel oil control valves	X	X						X		
.211 JP-5/DFM emergency supply valves	X	X								
.212 Relief valves	X	X				X				
.213 Burner supply header	X	X						X		X
.214 Burner supply valves	X	X		X						
.215 Gauges	X	X								
.216 Thermometers	X	X								

0219.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of fuel oil from the:
  - a. Tanks to the burners.
  - b. Burner manifold to the contaminated tank.
- .33 What indications will you receive if the system is malfunctioning?

0219.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Fuel oil supply pressure	X	X	X	X
.42 Fuel oil supply temperatures	X	X	X	

0219.5 SYSTEM INTERFACE

- .51 How does operation of the Atomizing Steam System affect this system?
- .52 How does this system interface with the following:
  - a. 150 PSI Auxiliary Steam System
  - b. Boiler Console System
  - c. 600 PSI Main Steam System
  - d. 600 PSI (V2 M8) Boiler System

0219.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0220 MAIN AND SECONDARY DRAINAGE SYSTEM

0220

## References:

- a. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- b. Ship's Information Book (SIB)
- c. Propulsion Operating Guide (POG)

0220.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0220.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/ component part?

	A	B	C
.21 Eductor	X	X	X
.22 Piping and valves	X	X	
.23 Steam bilge stripping pump	X	X	X
.24 Electric bilge pump	X	X	X
.25 Emergency bilge suction main circulating pump	X	X	
.26 Gauges	X	X	

0220.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0220.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Eductor suction pressure	X	X	X	
.42 Firemain pressure	X	X	X	
.43 Main drain relief pressure	X	X		
.44 Bilge level	X	X	X	X

0220.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in firemain pressure
  - b. Loss of electrical power

0220.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

0221 FIREMAIN SYSTEM

0221

## References:

- a. Naval Ships' Technical Manual, Chap 079 (NAVSEA S9086-CN-STM-010)
- b. Hull Maintenance Technician 3 & 2 (NAVEDTRA 10573)
- c. Fireman (NAVEDTRA 10520)

0221.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0221.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?
- E. What protection is provided by this component/component part?

	A	B	C	D	E
.21 Piping/valves	X	X			
.22 Fire pump motor	X	X	X		
.23 Fire pump	X	X			
.24 Marine strainers	X	X			X
.25 Gauges	X	X			
.26 Controller	X	X		X	X

0221.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0221.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 Suction/discharge pressures

0221.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:

- a. Loss of electrical power
- b. Operation of evaporators
- c. Operation of Main Drainage System
- d. Operation of air-conditioning plants

0221.5 SYSTEM INTERFACE (CONT'D)

.52 How does this system interface with the following:

- a. Main Drainage System
- b. Evaporator System

0221.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

## References:

- a. Propulsion Operating Guide (POG)
- b. Naval Ships' Technical Manual, Chap 9480 (New 505)  
(NAVSEA 0901-LP-480-0002)

0222.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0222.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What protection is provided by this component/component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Cooling water pump	X	X	X		
.22 Reducing valves	X	X			X
.23 Relief valves	X	X		X	X
.24 Piping and valves	X	X			
.25 Seawater strainers	X	X		X	
.26 Cross-connect valves	X	X			
.27 Gauges	X	X			

0222.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of:
  - a. Cooling water from the pump to the evaporator.
  - b. Cooling water from the firemain to the overboard.
  - c. Emergency cooling water from the firemain to the evaporator.
  - d. Emergency cooling water from the firemain to the air-conditioning units.

0222.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

	A	B	C
.41 Cooling water pump discharge pressure	X	X	X
.42 Relief valve settings	X		

0222.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Operation of evaporator
  - b. Operation of air-conditioning unit
- .52 How does this system interface with the Firemain System?

0222.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?



## References:

- a. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- b. Manufacturer's Technical Manual (NAVSEA 0958-006-7010)

## 0223.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0223.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?
- D. What are the probable indications if this component fails?

	A	B	C	D
.21 Evaporator shell	X	X		
.22 First-stage feed box	X	X		
.23 Second-stage feed box	X	X		
.24 Feedwater temperature regulator	X	X	X	X
.25 Vapor separators	X	X		
.26 Interstage seawater loop seal	X	X		X
.27 Interstage distillate loop seal	X	X		X
.28 First- and second-stage condensers	X	X		
.29 Seawater heater	X	X		
.210 Air ejector	X	X		X
.211 Air ejector condenser	X	X		
.212 Seawater drain regulator	X	X	X	X
.213 Seawater drain regulator pump	X	X		X
.214 Distillate pump	X	X		X
.215 Brine pump	X	X		X
.216 First- and second-stage flash chambers	X	X		
.217 Distillate cooler	X	X		X
.218 First-stage drain valves	X	X		X
.219 Salinity indicator	X	X		X
.220 Flowmeter	X	X		X
.221 Relief valves	X	X		X
.222 Distilling manifold	X	X	X	
.223 Evaporator feedwater pressure regulator	X	X	X	X
.224 Exhaust pressure regulator	X	X	X	X
.225 Desuperheater	X	X		X
.226 Chlorinator suction bottles	X	X		

0223.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

### 0223.3 PRINCIPLES OF OPERATION (CONT'D)

- .32 Using a diagram of the system, show the path of:
- Feedwater from the auxiliary cooling water pump suction to the brine overboard valve.
  - Distillate from the first-stage shell to the feedwater and potable water tanks.
  - 150 PSI steam from the reducer to the air ejector's drain valve.
  - Auxiliary exhaust from the regulator to the feed heater drain pump.
- .33 What indications will you receive if the system is malfunctioning?

### 0223.4 PARAMETERS

For the items listed answer the following questions:

- What are the normal operating values?
- Where are the parameters sensed?
- What is the physical location of the indicators?
- What is the alarm setpoint?

	A	B	C	D
.41 Feedwater pressure/temperature	X	X	X	
.42 Air ejector steam pressure	X	X	X	
.43 Distillate salinity	X	X	X	X
.44 Feed heater steam pressure/temperature	X	X	X	
.45 Distillate output (gallons per hour)	X	X	X	
.46 Relief valves lifting pressure	X		X	

### 0223.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
- Variations in/loss of 150 PSI steam
  - Variations in/loss of auxiliary cooling water
  - Variations in auxiliary exhaust steam pressure

### 0223.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0224 LOW-PRESSURE (LP) AIR SYSTEM

0224

## References:

- a. Machinist's Mate 3 & 2 (NAVEDTRA 10524)
- b. Propulsion Operating Guide (POG)
- c. Manufacturer's Technical Manual

0224.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0224.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/ component part?

	A	B	C
.21 LP air compressors	X	X	X
.22 Air receivers	X	X	X
.23 Piping and valves	X	X	
.24 Controllers	X	X	X
.25 Air dehydrators	X	X	X
.26 Gauges	X	X	
.27 Thermometers	X	X	

0224.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0224.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the alarm setpoint?

	A	B	C
.41 Unloading pressures	X	X	X
.42 Air pressure in accumulators	X	X	
.43 Relief valves lifting pressure	X		
.44 Air temperature	X	X	X
.45 Dehydrator temperature	X	X	X

0224.5 SYSTEM INTERFACE

.51 How do the following outside influences affect this system:

- a. Loss of electrical power
- b. Variations in air demand
- c. Loss of Auxiliary Machinery Cooling Water System

.52 How does this system interface with the following:

- a. 600 PSI Main Steam System
- b. 600 PSI Desuperheated Steam System
- c. 150 PSI Auxiliary Steam System
- d. Ship's Service Turbogenerator (SSTG) System

0224.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

## References:

- a. Propulsion Plant Manual (PPM)
- b. Propulsion Operating Guide (POG)
- c. Machinist's Mate 3 & 2 (NAVEDTRA 10524)

0225.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0225.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/component part?
- D. What are the probable indications if this component fails?

	A	B	C	D
.21 Aftercondenser	X	X	X	
.22 First-stage nozzles	X	X	X	X
.23 Second-stage nozzles	X	X	X	X
.24 Aftercondenser drains	X	X	X	
.25 First-stage air ejector drains	X	X	X	
.26 Innercondenser	X	X	X	X
.27 Loop seal	X	X	X	X
.28 Low-pressure (LP) drains	X	X		X
.29 Interstage baffles	X	X	X	
.210 Piping	X	X		
.211 Gland exhaustor	X	X	X	X
.212 Thermometers	X	X		
.213 Gauges	X	X		

0225.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0225.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

	A	B	C
.41 Steam pressure	X		X
.42 Water level (condensate)	X		X
.43 Relief valves lifting pressure	X		X
.44 Cooling water temperatures	X	X	X

0225.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in main condensate temperature/pressure
  - b. Variations in gland seal steam pressure
  - c. Variations in makeup feed rate
- .52 How does this system interface with the 150 PSI Auxiliary Steam System?

0225.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0226 HIGH-PRESSURE (HP) AIR SYSTEM

0226

References:

- a. Manufacturer's Technical Manual
- b. Ship's Information Book (SIB)

0226.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0226.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the safety/protective devices for this component/  
component part?
- D. What protection is provided by this component/component part?
- E. What are the probable indications if this component fails?

	A	B	C	D	E
.21 Condensate drain assembly	X	X	X	X	X
.22 Freshwater cooling assembly	X	X			
.23 Seawater cooling assembly	X	X			
.24 Air compressor piping and valves	X	X			
.25 Temperature sensing unit	X	X	X	X	X
.26 Air separators	X	X			
.27 Air filters	X	X			
.28 Air flask	X	X			

0226.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of air from the intake to the HP air flask.

0226.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

- .41 HP air discharge pressure
- .42 HP air discharge temperatures

0226.5 SYSTEM INTERFACE

- .51 How does operation of the Ship's Service Diesel Generator (SSDG) System affect this system?
- .52 How does this system interface with the Low-Pressure (LP) Air System?

0226.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?



0226.5 SYSTEM INTERFACE

- .51 How does operation of the Ship's Service Diesel Generator (SSDG) System affect this system?
- .52 How does this system interface with the Low-Pressure (LP) Air System?

0226.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. IC Electrician 3 (NAVEDTRA 10559)
- b. IC Electrician 2 (NAVEDTRA 10555)
- c. Manufacturer's Technical Manual

0227.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0227.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What is the source of power?
- D. What are the modes of operation or control?

	A	B	C	D
.21 Propeller revolution indicator	X	X		
.22 Engine order indicator	X	X		
.23 High-pressure (HP) throttle valve (manual)	X	X		
.24 Astern throttle valve (manual)	X	X		
.25 Salinity indicator	X	X		
.26 Main guarding valve	X	X	X	X
.27 Alarms, gauges, indicator pushbuttons	X	X		
.28 Speed indicator	X	X		X

0227.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0227.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

- .41 Salinity level
- .42 Temperature/pressure

0227.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Loss of steam pressure
  - b. Loss of electrical power

0227.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Manufacturer's Technical Manual (NAVSEA S9550-AB-MMA-010)
- b. Naval Ships' Technical Manual, Chap 593 (NAVSEA S9086-T8-STM-000)

0228.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0228.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the probable indications if this component fails?

	A	B	C
.21 Bilge waste water duplex strainer	X	X	X
.22 Vacuum pump	X	X	X
.23 Oil pump	X	X	X
.24 Flow totalizer	X	X	
.25 Main control panel	X	X	X
.26 Remote alarm panel	X	X	X
.27 Bilge and tanks suction lines	X	X	
.28 Water pump	X	X	X
.29 Piping and valves	X	X	
.210 Gauge panel	X	X	

0228.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of:
  - a. Bilge water from the bilge to the duplex strainer.
  - b. Bilge water from the duplex strainer to the separator tower.
  - c. Separated water from the separator tank to the overboard discharge and the tank discharge.
  - d. Separated oil from the separator tank to the waste oil tank.

0228.4 PARAMETERS - None to be discussed.

0228.5 SYSTEM INTERFACE

- .51 How does loss of electrical power affect this system?

0228.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Manufacturers' Technical Manuals
- b. Ship's Information Book (SIB)

0229.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0229.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the probable indications if this component fails?

	A	B	C
.21 Burner management console (local)	X	X	X
.22 Burner management console (automatic)	X	X	X
.23 Automatic boiler control console	X	X	X
.24 Boiler section gauge and alarms	X	X	
.25 Boiler section valve and pump indicating pushbuttons		X	X
.26 Masoneilan main feed pump control	X	X	X

0229.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 What indications will you receive if the system is malfunctioning?

0229.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?

- .41 Temperature
- .42 Pressure

0229.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
- a. Loss of or fluctuation in electrical power
  - b. Loss of control air

0229.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

0230 NO-BREAK POWER SUPPLY SYSTEM

0230

## References:

- a. Manufacturer's Technical Manual

## 0230.1 What is the function of this system?

- .11 Draw a diagram of this system showing major components.  
 .12 Refer to a standard print of this system or to the actual equipment listed below.

0230.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?  
 B. Where is it located?  
 C. What are the probable indications if this component fails?

	A	B	C
.21 Power supply cabinet	X	X	X
.22 Control cabinet	X	X	
.23 Motor-generator (M/G) set	X	X	X
.24 Normal supply circuit breaker (CB)	X	X	X
.25 Direct-current (DC) motor CB	X	X	X
.26 Alternating-current (AC) generator vital load CB	X	X	X
.27 Battery CB	X	X	X
.28 AC voltmeter	X	X	X
.29 Kilowattmeter	X	X	X
.210 DC power supply ammeter	X	X	X
.211 Battery ammeter	X	X	X
.212 Synchroscope	X	X	X
.213 DC bus	X	X	X
.214 AC ammeter	X	X	X
.215 Frequency meter	X	X	X
.216 AC power supply switch	X	X	
.217 DC power supply switch	X	X	
.218 Synchroscope switch	X	X	
.219 Voltmeter/frequency meter selector switch	X	X	
.220 Emergency bypass switch	X	X	

0230.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?  
 .32 What indications will you receive if the system is malfunctioning?

0230.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 AC generator voltage
- .42 AC generator amperage
- .43 AC generator frequency
- .44 AC generator kilowatts
- .45 DC bus voltage
- .46 DC bus amperage
- .47 Battery amperage

0230.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Loss of Alternating-Current (AC) Ship's Service Distribution System
  - b. Low battery voltage
- .52 How does this system interface with the Ship's Service Switchboard Control Unit System?

0230.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Manufacturer's Technical Manual
- b. Ship's Information Book (SIB)
- c. Naval Ships' Technical Manual, Chap 300 (NAVSEA S9086-KC-STM-001)
- d. Naval Ships' Technical Manual, Chap 320 (NAVSEA S9086-KY-STM-000)

0231.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0231.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?

- .21 Indicator lights
- .22 Bus tie switch
- .23 Generator circuit breaker (CB) switch
- .24 Heater switch
- .25 Voltage regulator transfer switch
- .26 Bus transfer switch
- .27 Diesel start pushbutton
- .28 Manual voltage adjusting rheostat
- .29 Automatic voltage adjusting rheostat
- .210 Ground test switches
- .211 Ammeters
- .212 Voltmeters
- .213 Wattmeters
- .214 Frequency meters
- .215 Governor motor switches
- .216 Droop switches
- .217 Synchroscope
- .218 Synchronizing switch
- .219 Synchronizing lights
- .220 Shore power phase sequence indicator
- .221 Shore power CB switch
- .222 Phase-sequence control switch
- .223 Reverse-power relay

0231.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?

0231.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?

- .41 Generator output voltage
- .42 Generator output amperage
- .43 Generator output frequency
- .44 Generator output kilowatts
- .45 Shore power voltage
- .46 Shore power amperage
- .47 Shore power frequency

0231.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Variations in speed of prime mover
  - b. Loss of instrument transformer
- .52 How does this system interface with the following:
  - a. 600 PSI Main Steam System
  - b. Alternating-Current (AC) Ship's Service Distribution System

0231.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?



0232     ALTERNATING-CURRENT (AC) SHIP'S SERVICE DISTRIBUTION SYSTEM     0232

References:

- a. Manufacturer's Technical Manual
- b. Ship's Information Book (SIB)
- c. Naval Ships' Technical Manual, Chap 300 (NAVSEA S9086-KC-STM-001)
- d. Naval Ships' Technical Manual, Chap 320 (NAVSEA S9086-KY-STM-000)

0232.1     What is the function of this system?

- .11     Draw a diagram of this system showing all components listed below.

0232.2     SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A.     What is its function?
  - B.     Where is it located?
  - C.     What are the positions and functions of each position?
- .21     Disconnect links
  - .22     Bus tie circuit breakers (CBs)
  - .23     Generator CBs
  - .24     Shore power CB
  - .25     Vital/semivital CBs
  - .26     AC casualty power CB

0232.3     PRINCIPLES OF OPERATION

- .31     How do the components work together to achieve the system's function?
- .32     Using a diagram of the system, show the path of current flow from:
  - a.     The generator to the vital/semivital CBs.
  - b.     The generator to the casualty power CB.
- .33     What indications will you receive if the system is malfunctioning?

0232.4     PARAMETERS

For the items listed answer the following questions:

- A.     What are the normal operating values?
- .41     Bus tie CB current rating
  - .42     Ship's service turbogenerator (SSTG) current rating

0232.5     SYSTEM INTERFACE

- .51     How do the following outside influences affect this system:
  - a.     Variations in voltage, current and frequency in SSTGs
  - b.     Loss of shore power

0232.5 SYSTEM INTERFACE (CONT'D)

- .52 How does this system interface with the following:
  - a. Ship's Service Turbogenerator (SSTG) System
  - b. Shore Power System

0232.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?
- .62 What special safety precautions apply to:
  - a. Opening disconnect links
  - b. Racking out generator/bus tie CBs

0233 IMPRESSED-CURRENT CATHODIC PROTECTION SYSTEM

0233

## References:

- a. Manufacturer's Technical Manual
- b. Naval Ships' Technical Manual, Chap 9190 (New 633)  
(NAVSEA 0901-LP-190-0003)

0233.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0233.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?

	A	B	C
.21 Saturable reactor	X	X	X
.22 Voltmeter	X	X	
.23 Voltage adjust rheostat	X	X	
.24 Ammeter	X	X	
.25 Power panel	X	X	X
.26 Sensing electrodes	X	X	
.27 Anodes	X	X	

0233.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 What indications will you receive if the system is malfunctioning?

0233.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. What is the physical location of the indicators?

- .41 Power supply output amperage
- .42 Reference voltage output
- .43 Control/auxiliary cell voltage

0233.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Loss of ship's power
  - b. Variations in water conditions
  - c. Variations in hull conditions

0233.4 SYSTEM INTERFACE (CONT'D)

.52 How does this system interface with the following:

- a. Ship's Underwater Hull System
- b. Diving operations

0233.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

.62 What special safety precautions apply to:

- a. Securing system prior to divers going into water
- b. Excess output current

## References:

- a. Manufacturer's Technical Manual
- b. Engineering Operational Sequencing System (EOSS)
- c. Naval Ships' Technical Manual, Chap 562 (NAVSEA S9086-TA-STM-000)

0234.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0234.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the modes of operation or control?

	A	B	C
.21 Ram and cylinder assembly	X	X	X
.22 Power unit assembly (pump)	X	X	X
.23 Trick wheel	X	X	X
.24 Shift lever	X	X	X
.25 Helm pointer	X	X	
.26 Rudder pointer	X	X	
.27 Stop arm	X	X	
.28 Linkage assembly	X	X	
.29 Service tank	X	X	
.210 Storage tank	X	X	
.211 Rudder angle indicator	X	X	
.212 Emergency steering hand pump	X	X	
.213 Replenishment/transfer pump	X	X	
.214 Synchro transmitter control	X	X	X
.215 Filters	X	X	
.216 Strainers	X	X	
.217 Automatic transfer switch	X	X	X
.218 Relief valve	X	X	
.219 Replenishing valve	X	X	
.220 Solenoids	X	X	

0234.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of hydraulic fluid from:
  - a. The storage tank to replenishment tanks.
  - b. The power unit assembly discharge to the power unit assembly suction.
  - c. The emergency steering pump discharge to the emergency steering pump suction.

0234.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. Where are the parameters sensed?
- C. What is the physical location of the indicators?
- D. What is the alarm setpoint?

	A	B	C	D
.41 Hydraulic pressure	X	X	X	X
.42 Servopressure	X	X	X	
.43 Storage tank level	X	X	X	
.44 Replenishing tank level	X	X	X	

0234.5 SYSTEM INTERFACE

- .51 How do the following outside influences affect this system:
  - a. Loss of electrical power
  - b. Variations in ambient air temperature

0234.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?

## References:

- a. Naval Ships' Technical Manual, Chap 9150 (New 542)  
(NAVSEA 0901-LP-150-0003)

0235.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0235.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?  
B. Where is it located?  
C. What are the probable indications if this component fails?

	A	B	C
.21 JP-5 fuel filter separators	X	X	X
.22 JP-5 transfer pumps	X	X	X
.23 JP-5 service pump	X	X	X
.24 Storage tanks	X	X	
.25 Helicopter service tank	X	X	
.26 Helicopter refueling station	X	X	
.27 Small boat refueling stations	X	X	
.28 Auxiliary boiler fueling line	X	X	
.29 Stripping piping and valves	X	X	
.210 Diesel fuel marine (DFM)/JP-5 cross-connect manifold	X	X	X
.211 Emergency shutdown switch	X	X	X
.212 Relief valves	X	X	

0235.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of JP-5 from:
- The fuel risers to the storage tanks.
  - The storage tanks to the helicopter service tank.
  - The storage and helicopter service tank to the ship's service diesel generator (SSDG) service tank.
  - The storage and helicopter service tank to the boat fueling stations.
  - The helicopter service tank to the helicopter fueling station.
  - The helicopter fueling station to the storage tanks.

0235.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. What is the alarm setpoint?
- C. What is the relief valve setting?

	A	B	C
.41 Tank level	X		
.42 Pump discharge pressure	X		X
.43 Overflow setting	X	X	

0235.5 SYSTEM INTERFACE - None to be discussed.

0235.6 SAFETY PRECAUTIONS

- .61 What general safety precautions apply to this system?
- .62 What special safety precautions apply for NAVAIR fueling?



## References:

- a. Manufacturer's Technical Manual
- b. Engineman 3 & 2 (NAVEDTRA 10541)
- c. Naval Ships' Technical Manual, Chap 233 (NAVSEA S9086-HB-STM-000)

0236.1 What is the function of this system?

- .11 Refer to a standard print of this system or to the actual equipment.

0236.2 SYSTEM COMPONENTS AND COMPONENT PARTS

Discuss the designated items for the following components and component parts:

- A. What is its function?
- B. Where is it located?
- C. What are the probable indications if this component fails?

	A	B	C
.21 Lube oil pump	X	X	X
.22 Lube oil filter	X	X	X
.23 Lube oil cooler	X	X	X
.24 Freshwater pump	X	X	X
.25 Piston cooling pump	X	X	X
.26 Fuel pump	X	X	X
.27 Engine block assembly	X	X	
.28 Engine head assembly	X	X	
.29 Governor and overspeed trip assembly	X	X	X
.210 Blowers	X	X	
.211 Starting unit	X	X	
.212 Exhaust manifold and muffler	X	X	
.213 Scavenging oil pump	X	X	X

0236.3 PRINCIPLES OF OPERATION

- .31 How do the components work together to achieve the system's function?
- .32 Using a diagram of the system, show the path of:
  - a. Raw water from the firemain/circulating pump to the overboard.
  - b. Freshwater from the pump discharge to the pump suction.
  - c. Lube oil from the storage tank to the sump.
  - d. Lube oil from the sump through the engine.
  - e. Fuel oil from the suction line on the day tank to the return line on the day tank.
  - f. Scavenging air from the atmosphere to exhaust gases.

#### 0236.4 PARAMETERS

For the items listed answer the following questions:

- A. What are the normal operating values?
- B. What is the physical location of the indicators?
- C. What is the alarm setpoint?

	A	B	C
.41 RPM	X	X	
.42 Frequency	X	X	
.43 Lube oil engine pressure	X		X
.44 Lube oil filter pressure	X		X
.45 Lube oil indicator temperature	X	X	
.46 Freshwater temperature	X		X
.47 Freshwater pressure	X		
.48 Raw water temperature	X		
.49 Raw water pressure	X		
.410 Expansion tank level	X	X	
.411 Fuel pressure	X	X	
.412 Scavenging air pressure	X		
.413 Exhaust temperature	X		X
.414 Fuel day tank level/capacity	X	X	X

#### 0236.5 SYSTEM INTERFACE

.51 How do the following outside influences affect this system:

- a. Loss of electrical power
- b. Switchboard malfunction/casualty
- c. Variations in electrical load demand

#### 0236.6 SAFETY PRECAUTIONS

.61 What general safety precautions apply to this system?

This qualification section is to be maintained by the trainee and updated to ensure awareness of remaining tasks.

Having observed satisfactory performance, it is recommended the trainee be designated a qualified LKA-113 CLASS ENGINEERING OFFICER OF THE WATCH (E00W) (0301).

RECOMMENDED \_\_\_\_\_ DATE \_\_\_\_\_  
(Supervisor)

RECOMMENDED \_\_\_\_\_ DATE \_\_\_\_\_  
(Division Officer)

RECOMMENDED \_\_\_\_\_ DATE \_\_\_\_\_  
(Department Head)

QUALIFIED \_\_\_\_\_ DATE \_\_\_\_\_  
(Commanding Officer)

SERVICE RECORD ENTRY \_\_\_\_\_ DATE \_\_\_\_\_  
(Personnel Officer)

LKA-113 CLASS ENGINEERING OFFICER OF THE WATCH (EOOW)

QUALIFICATION SUMMARY

PQS INDOCTRINATION

COMPLETED \_\_\_\_\_  
(Department Head/Date)

0301 WATCHSTATION - LKA-113 CLASS ENGINEERING OFFICER OF THE  
WATCH (EOOW)

0301

Estimated completion time: 55 weeks

Completion of the following is required prior to approval of watchstation qualification:

Water King/Oil King (NAVEDTRA 43116-5C), Water Chemistry Watchstation Requirements (page xiii)

Before starting your assigned tasks, complete the following items:

Fundamentals: 0101 thru 0105 (6% of watchstation)

Systems: 0201 thru 0236 (74% of watchstation)

0301.1 TASKS

For the tasks listed below:

- A. What are the steps of this procedure?
- B. What control/coordination is required?
- C. What communications must be established?
- D. What safety precautions must be observed?
- E. What parameters must be monitored?
- F. Perform this task IAW EOSS/EDORM.

.11 Light off engineering plant with steam

A	B	C	D	E	F
X	X	X	X	X	X

\_\_\_\_\_  
(Signature) (Date)

.12 Light off engineering plant without steam

X X X X X X

\_\_\_\_\_  
(Signature) (Date)

.13 Warm up/test main engine

X X X X X X

\_\_\_\_\_  
(Signature) (Date)

.14 Place additional boiler on line

X X X X X X

\_\_\_\_\_  
(Signature) (Date)

.15 Secure second boiler on line

X X X X X X

\_\_\_\_\_  
(Signature) (Date)

0301.1 TASKS (CONT'D)

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
.16 Shut down engineering plant to auxiliary steaming	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.17 Shut down engineering plant to cold iron	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.18 Bring additional SSTG on line	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.19 Balance electrical load distribution	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.110 Supervise surface/bottom blow boilers	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.111 Supervise blow tubes, main boiler	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.112 Shift steering cables and engine	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.113 Shift evaporator distilling to feed/freshwater	X				X	X
<u>(Signature)</u>						<u>(Date)</u>
.114 Shift fire pumps while maintaining proper firemain pressure	X		X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>
.115 Shift fuel oil suction	X	X	X	X	X	X
<u>(Signature)</u>						<u>(Date)</u>

0301.1 TASKS (CONT'D)

	A	B	C	D	E	F
.116 Transfer fuel oil	X	X	X	X	X	X
_____ (Signature) _____ (Date)						
.117 Shift main engine lube oil strainers	X	X	X	X	X	X
_____ (Signature) _____ (Date)						
.118 Analyze chemical test and treat boiler	X	X			X	X
_____ (Signature) _____ (Date)						
.119 Analyze daily dissolved oxygen report	X	X			X	X
_____ (Signature) _____ (Date)						
.120 Maintain engineering log	X	X			X	X
_____ (Signature) _____ (Date)						
.121 Receive daily fuel oil and hourly water report	X	X			X	X
_____ (Signature) _____ (Date)						
.122 Receive daily draft report	X	X				X
_____ (Signature) _____ (Date)						
.123 Receive SSDG report	X	X				X
_____ (Signature) _____ (Date)						
.124 Execute night orders as applicable	X					X
_____ (Signature) _____ (Date)						
.125 Use communications systems in central control	X	X	X			X
_____ (Signature) _____ (Date)						
.126 Test casualty flooding and high-temperature alarm	X	X	X			X
_____ (Signature) _____ (Date)						